Claims

[c1] 1.An article for use in a high temperature, oxidative environment, comprising:
a substrate; and
a protective layer disposed over said substrate, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof.

[c2] 2.The article of claim 1, further comprising a top layer disposed over said protective layer, said top layer comprising a thermal barrier layer.

[c3] 3.The article of claim 2, wherein said thermal barrier layer comprises a ceramic.

[c4] 4.The article of claim 3, wherein said ceramic comprises yttria-stabilized zirconia.

[c5] 5.The article of claim 2, wherein said thermal barrier layer has a thickness of at least about 25 microns.

[c6] 6.The article of claim 5, wherein said thickness is in the range from about 100 microns to about 250 microns.

[c7] 7.The article of claim 2, further comprising a diffusion barrier layer interposed between said substrate and said protective layer.

[c8] 8.The article of claim 7, wherein said diffusion barrier layer comprises ruthenium.

[c9] 9.The article of claim 7, wherein said diffusion barrier layer has a thickness in the range from about 5 microns to about 100 microns.

[c10] 10.The article of claim 9, wherein said thickness is in the range from about 10 microns to about 50 microns.

[c11] 11.The article of claim 1, further comprising a diffusion barrier layer interposed between said substrate and said protective layer.

[c12] 12.The article of claim 11, wherein said diffusion barrier layer comprises ruthenium.

[c13] 13.The article of claim 11, wherein said diffusion barrier layer has a thickness in the range from about 5 microns to about 100 microns.

[c14] 14.The article of claim 13, wherein said thickness is in the range from about 10 microns to about 50 microns.

[c15] 15.The article of claim 1, wherein said substrate comprises a superalloy.

[c16] 16.The article of claim 15, wherein said superalloy comprises at least one of a cobalt-based alloy, a nickel-based alloy, and an iron-based alloy.

[c17] 17.The article of claim 16, wherein said alloy comprises one of a single crystal alloy and a directionally solidified alloy.

[c18] 18.The article of claim 1, wherein said substrate comprises a component of a gas turbine assembly.

[c19] 19.The article of claim 18, wherein said component comprises one of a turbine blade, a vane, and a combustor component.

[c20] 20.The article of claim 1, wherein said protective layer comprises at least about 85 atomic percent of said metal.

[c21] 21.The article of claim 1, wherein said protective layer has a thickness of at least about 5 microns.

[c22] 22.The article of claim 21, wherein said thickness is in the range from about 10 microns to about 250 microns.

[c23] 23.A component for a gas turbine assembly, comprising:

a substrate comprising one of a turbine blade, a vane, and a combustor component;

a diffusion barrier layer disposed over said substrate, said diffusion barrier layer comprising ruthenium;

a protective layer disposed over said diffusion barrier layer, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and

a thermal barrier layer comprising yttria-stabilized zirconia disposed over said

protective layer.

[c24] 24.A component for a gas turbine assembly, comprising:
a substrate comprising one of a turbine blade, a vane, and a combustor component;
a protective layer disposed over said substrate, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
a thermal barrier layer comprising yttria-stabilized zirconia disposed over said protective layer.

[c25] 25.A component for a gas turbine assembly, comprising:
a substrate comprising one of a turbine blade, a vane, and a combustor component;
a diffusion barrier layer disposed over said substrate, said diffusion barrier layer comprising ruthenium; and
a protective layer disposed over said diffusion barrier layer, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof.

[c26] 26.A material system for protecting an article in a high temperature, oxidative environment, said system comprising:
a protective layer, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir and mixtures thereof.

[c27] 27.The system of claim 26, further comprising a top layer disposed over said protective layer, said top layer comprising a thermal barrier layer.

[c28] 28.The system of claim 27, wherein said thermal barrier layer comprises a ceramic.

[c29] 29.The system of claim 28, wherein said ceramic comprises yttria-stabilized zirconia.

[c30]

30.The system of claim 27, wherein said thermal barrier layer has a thickness of

at least about 25 microns.

[c31] 31.The system of claim 30, wherein said thickness is in the range from about 100 microns to about 250 microns.

[c32] 32.The system of claim 27, further comprising a diffusion barrier layer, wherein said protective layer is disposed over said diffusion barrier layer.

[c33] 33.The system of claim 32, wherein said diffusion barrier layer comprises ruthenium.

[c34] 34.The system of claim 32, wherein said diffusion barrier layer has a thickness in the range from about 5 microns to about 100 microns.

[c35] 35.The system of claim 34, wherein said thickness is in the range from about 10 to 50 microns.

[c36] 36.The system of claim 26, further comprising a diffusion barrier layer interposed between said substrate and said protective layer.

[c37] 37.The system of claim 36, wherein said diffusion barrier layer comprises ruthenium.

[c38] 38.The system of claim 36, wherein said diffusion barrier layer has a thickness in the range from about 5 microns to about 100 microns.

[c39] 39.The system of claim 38, wherein said thickness is in the range from about 10 microns to about 50 microns.

[c40] 40.The system of claim 26, wherein said protective layer comprises at least about 85 atomic percent of said at least one metal.

[c41] 41.The system of claim 26, wherein said protective layer has a thickness of at least about 5 microns.

[c42] 42.The system of claim 41, wherein said thickness is in the range from about 10 microns to about 250 microns.

[c43] 43.A material system for protecting a component of a gas turbine assembly,

said system comprising:
a diffusion barrier layer comprising ruthenium;
a protective layer disposed over said diffusion barrier layer, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
a thermal barrier layer comprising yttria-stabilized zirconia disposed over said protective layer.

[c44] 44.A material system for protecting a component of a gas turbine assembly, said system comprising:
a protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
a thermal barrier layer comprising yttria-stabilized zirconia disposed over said protective layer.

[c45] 45.A method for manufacturing an article for use in a high temperature, oxidative environment, comprising:
providing a substrate; and
disposing a protective layer over said substrate, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof.

[c46] 46.The method of claim 45, further comprising disposing a top layer over said protective layer, said top layer comprising a thermal barrier layer.

[c47] 47.The method of claim 45, wherein disposing said thermal barrier layer comprises depositing said thermal barrier layer using at least one of ion plasma deposition, physical vapor deposition, high-velocity oxyfuel deposition, plasma spraying, and chemical vapor deposition.

[c48] 48.The method of claim 45, wherein disposing said thermal barrier layer comprises disposing a ceramic.

[c49] 49.The method of claim 48, wherein disposing said ceramic comprises disposing yttria-stabilized zirconia.

[c50] 50.The method of claim 46, further comprising disposing a diffusion barrier layer over said substrate, wherein said diffusion barrier layer is interposed between said substrate and said protective layer.

[c51] 51.The method of claim 50, wherein disposing said diffusion barrier layer comprises depositing said layer using at least one of ion plasma deposition, physical vapor deposition, high-velocity oxyfuel deposition, plasma spraying, chemical vapor deposition, and electroplating.

[c52] 52.The method of claim 50, wherein disposing said diffusion barrier layer comprises disposing material comprising ruthenium.

[c53] 53.The method of claim 45, further comprising disposing a diffusion barrier layer over said substrate, wherein said diffusion barrier layer is interposed between said substrate and said protective layer.

[c54] 54.The method of claim 53, wherein disposing said diffusion barrier layer comprises depositing said layer using at least one of ion plasma deposition, physical vapor deposition, high-velocity oxyfuel deposition, plasma spraying, chemical vapor deposition, and electroplating.

[c55] 55.The method of claim 53, wherein disposing said diffusion barrier layer comprises disposing material comprising ruthenium.

[c56] 56.The method of claim 45, wherein providing said substrate comprises providing a superalloy, said superalloy comprising one of a cobalt-based alloy, a nickel-based alloy, and an iron-based alloy.

[c57] 57.The method of claim 45, wherein providing said substrate comprises providing a component of a gas turbine assembly.

[c58] 58.The method of claim 57, wherein said component comprises one of a turbine blade, a vane, and a combustor component.

[c59]

59.The method of claim 45, wherein disposing said protective layer comprises depositing said protective layer using at least one of ion plasma deposition, physical vapor deposition, high-velocity oxyfuel deposition, plasma spraying,

chemical vapor deposition, and electroplating.

[c60] 60.The method of claim 45, wherein said protective layer comprises at least about 85 atomic percent of said at least one metal.

[c61] 61.A method for manufacturing a component for a gas turbine assembly, comprising:
providing a substrate selected from the group consisting of a turbine blade, a vane, and a combustor component;
disposing a diffusion barrier layer comprising ruthenium over said substrate;
disposing a protective layer over said diffusion barrier layer, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
disposing a thermal barrier layer comprising yttria-stabilized zirconia over said protective layer.

[c62] 62.A method for manufacturing a component for a gas turbine assembly, comprising:
providing a substrate selected from the group consisting of a turbine blade, a vane, and a combustor component;
disposing a protective layer over substrate, said protective layer comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
disposing a thermal barrier coating comprising yttria-stabilized zirconia over said protective layer.

[c63] 63.An article for use in a high temperature, oxidative environment, comprising:
a substrate comprising at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and
a thermal barrier layer disposed over said substrate.

[c64] 64.The article of claim 63, wherein said thermal barrier layer comprises a ceramic.

[c65] 65.The article of claim 64, wherein said ceramic comprises yttria-stabilized zirconia.

[c66] 66.The article of claim 63, wherein said thermal barrier layer has a thickness in the range from about 50 microns to about 500 microns.

[c67] 67.The article of claim 66, wherein said thickness is in the range from about 100 to about 250 microns.

[c68] 68.The article of claim 63, wherein said substrate comprises at least about 85 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof.

[c69] 69.The article of claim 63, wherein said substrate comprises a gas turbine assembly component.

[c70] 70.The article of claim 69, wherein said component comprises one of a turbine blade, a vane, and a combustor component.

[c71] 71.A component for a gas turbine assembly, comprising:

a substrate comprising one of a turbine blade, a vane, and a combustor component, wherein said substrate comprises at least about 60 atomic percent of a metal selected from the group consisting of Pt, Pd, Rh, Os, Ir, and mixtures thereof; and

a thermal barrier layer disposed over said substrate, said layer comprising yttria-stabilized zirconia.

[c72]